



Diet and acne: an exploratory survey study of patient beliefs

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Key words: acne, diet, Internet, dermatologist, foods

Citation: Nguyen QG, Markus R, Katta R. Diet and acne: an exploratory survey study of patient beliefs. *Dermatol Pract Concept* 2016;6(2):5. doi: 10.5826/dpc.0602a05

Received: November 6, 2015; **Accepted:** January 10, 2016; **Published:** April 30, 2016

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Funding: None.

Competing interests: The authors have no conflicts of interest to disclose.

All authors have contributed significantly to this publication.

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ABSTRACT **Background:** In the past, medical literature reflected that diet was not a proven cause of acne. However, studies in recent years have substantiated a link between certain dietary factors and acne. It is unclear whether patients are aware of recent research findings.

Objectives: Acne patients were surveyed to explore beliefs regarding the link between diet and acne, to determine whether these beliefs translated into behavior change and to identify health information sources.

Patients/Methods: Upon Institutional Review Board (IRB) approval, surveys were administered to 50 acne patients at an academic dermatology clinic in 2014, with 49 completed in full and included in this analysis.

Results: Ninety-two percent of respondents believed that diet could affect acne. Seventy-one percent attempted to change their diet to improve acne. Seventy-one percent believed acne to be caused by fried or greasy foods, although chocolate (53%), dairy (47%), and soda drinks (35%) were highly implicated. Patients obtained information from Google searches (49%), dermatologists (43%), family members and TV (41% each), and medical websites (31%).

Conclusions: In this exploratory study, patients reported utilizing a diversity of information sources, a majority from the Internet. In those surveyed, there was a persistence of long-held belief that fried/greasy foods and chocolate may serve as acne triggers, and less belief in trigger foods supported by recent research, including refined carbohydrates and sugar. Given the multiplicity of beliefs and utilized sources among acne patients in our survey, there is a need to establish up-to-date and reliable methods to educate patients on diet and acne.

Introduction

Research on the link between diet and acne goes back decades. In the 1960s, several research groups studied this subject, and

one of the largest studies involved 65 patients. Over a four-week period, subjects were administered either a chocolate bar or a placebo bar, and no difference in acne severity was seen [1]. Based on such studies, patients were counseled

that diet did not impact acne. This belief was reflected in textbooks, patient information brochures, and the medical literature [2].

However, later researchers noted methodological flaws in the original study, including the fact that the placebo bar contained a similar total sugar and fat content as the chocolate bar [3]. Further studies have now correlated a number of dietary factors and acne. The strongest studies to date indicate that dietary glycemic load may contribute to acne. A randomized controlled trial of Australian males [4] demonstrated significant improvement of acne severity after 12 weeks of adherence to a low-glycemic-load diet, compared to the high-glycemic-load diet control group. Follow-up studies [5,6] have noted that switching to a low glycemic diet led to better insulin sensitivity, lower androgen bioavailability, and altered skin sebum production. It is not known, however, what role individual differences, duration of dietary changes, and other factors play in this association. Therefore, studies such as Di Landro et al.'s [7] have documented the opposing view that weekly consumption of cakes, sweets, and chocolate—foods high in glycemic load—was not associated with a higher risk of acne.

In addition, researchers examining the link between dairy consumption and acne have noted some association. Studies [8,9,10] have demonstrated this link in three separate populations, though in each instance the correlation results were considered relatively weak. Closer evaluation of this link revealed that only skim milk showed a statistically significant correlation with acne, perhaps due to its increased processing and/or decreased estrogen content in comparison to whole milk [8].

A number of other dietary factors have been studied for their potential role in improving acne. For example, an inverse relationship has been found between acne severity and consumption of omega-3-rich fish [11,7] with the mechanism of action postulated as omega-3-mediated reduction of inflammatory acne [12]. While some promising results have been noted from in vitro or animal studies, studies in humans are limited, and each of these dietary factors requires further investigation before recommendations may be made to patients. These include foods or supplements containing vitamin A, omega-3 fatty acids, zinc, antioxidants, and fiber. [12].

Given that the scientific literature on this topic is rapidly evolving, it would be expected that patients might receive conflicting advice. Patients have long held certain beliefs about diet and acne, including the common perception that fried, greasy foods would lead to oily skin and acne. However, it is not known whether patients are aware of the research findings that support a link between specific dietary factors and acne. Patients seek out and receive medical information from multiple sources, and current patient beliefs about diet and acne are not known.

This study was designed to be an initial, exploratory survey study of current patient perceptions about the link between diet and acne. The aim was to identify common beliefs, misconceptions, and current information sources regarding the connection between diet and acne. As in other exploratory survey studies [13], these findings would help indicate directions for future research and would be of benefit to clinicians when counseling patients.

Materials and methods

This protocol was approved by the Baylor College of Medicine Institutional Review Board. Patients presenting to an academic dermatology clinic for the treatment of acne or acne scarring were asked if they wished to participate in a survey study about the link between diet and acne. If so, they completed a self-administered questionnaire prior to the physician visit. Subjects were asked to classify their acne from mild to severe, based on their personal perception of the disease's impact. Demographic data, such as age, gender, weight, height, and education level, was included in the questionnaire. Surveys were administered from March to November of 2014.

Results

Of the 50 questionnaires administered, 49 were completed in full and were included in the analysis. The mean age of

TABLE IA. Sample characteristics, N (%).
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<i>Gender</i>	
Male	11 (22.4)
Female	38 (77.6)
<i>Age</i>	
16-19	5 (10.2)
20-29	24 (48.9)
30-39	17 (34.7)
40-45	3 (6.1)
<i>BMI</i>	
<18.5	3 (6.1)
18.5-24.9	31 (63.3)
25-29.9	13 (26.5)
30+	2 (4.1)
<i>Education</i>	
<High school	1 (2.0)
High school	3 (6.1)
College+	45 (91.8)

TABLE IB. Self reported acne severity, N (%).
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Mild	x	x			
Moderate		x	x	x	
Severe				x	x
Total N = 49	13 (26.5)	1 (2.0)	29 (59.2)	1 (2.0)	5 (10.2)

TABLE IC. Gender and belief that diet can affect acne, N (%).
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	Not at all	Slightly	Somewhat	A lot	Completely
Male	1 (9.1)	0 (0)	6 (54.5)	3 (27.3)	1 (9.1)
Female	3 (7.9)	5 (13.1)	15 (39.5)	14 (36.8)	1 (2.6)
Total N = 49	4 (8.2)	5 (10.2)	21 (42.8)	17 (34.7)	2 (4.1)

patients was 28.5 years (range, 16 to 45 years); 38 were female and 11 were male. Three respondents had an underweight BMI of less than 18.5; 30 respondents had a normal BMI between 18.5-24.9; 13 respondents were overweight with BMI 25-29.9; and 2 respondents qualified as obese with BMI greater than 30.0. A majority, 45 of 49 respondents, was educated at the college level (Table Ia). Respondents reported the following acne severity distribution: 13 patients had mild acne, 1 patient had mild-moderate, 29 patients had moderate, 1 had moderate-severe, and 5 had severe acne (Table Ib).

Among our population, patients overwhelmingly believed that diet could affect acne (Table Ic). Only 3 of 38 (8%) female patients and 1 of 11 (9%) male patients believed that diet had no effect on acne. Of female patients, 30 of 38 (81%) patients believed that diet affected acne either somewhat, a lot, or was the complete cause of acne. Among male patients, results were similar: 10 of 11 (91%).

A majority, 35 of 49 patients (71%), had changed their diets in order to help their acne (Table Iia). Thirteen of the 35 (37%) tried dietary changes before medications, compared to the 14 patients that first attempted medications. Of those 14, 9 tried over-the-counter medications first (25%) and 5 tried prescription first (14%). Four patients tried a combination of dietary changes with prescription medications (11%); 2 combined dietary changes with over-the-counter medications (6%); and the remaining tried a combination of all three or

a combination of over-the-counter and prescription medications (Table Iib).

The dietary item most frequently implicated to worsen acne was fried, greasy foods (71%). Other responses included chocolate (53%), followed by dairy products (47%). This was followed by soda drinks (35%), caffeine (27%), and refined carbohydrates (27%). Among the named categories of dietary items believed to aggravate acne, sugar was named by the lowest percentage of respondents (16%). A total of 10% of respondents listed “other” (Table IIIa).

The majority of respondents believed that certain foods or supplements could help acne. A minority (27%) believed that food or supplements did not help acne. The category listed by most respondents as helping acne was that of vitamin A (41%), followed by antioxidants (33%), fish/omega-3s (29%), and zinc (27%) (Table IIIb).

Of respondents, a minority reported improvement with dietary changes. Twenty percent reported acne improvement with less fried or greasy foods, followed by 14% reporting

TABLE IIA. Changed diet to improve acne, N (%). [Copyright: ©2016 Nguyen et al.]

Yes	35 (71.4)
No	14 (28.6)

TABLE IIB. Acne interventions that patients first attempted, N (%).
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Diet	x			x	x	x	
OTC meds		x		x		x	x
Rx meds			x		x	x	x
Total N = 35	13 (37.1)	9 (25.7)	5 (14.3)	2 (5.7)	4 (11.4)	1 (2.8)	1 (2.8)

TABLE IIIA. Dietary items believed by patients to aggravate acne, *n* (% n/N).
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Fried or greasy foods	35 (71.4)
Chocolate	26 (53.1)
Dairy products	23 (46.9)
Soda drinks	17 (34.7)
Caffeine	13 (26.5)
Refined carbohydrates	13 (26.5)
Spicy foods	10 (20.4)
Sugar	8 (16.3)
Other	5 (10.2)
N/A - diet Ø aggravate acne	1 (2.0)

TABLE IIIB. Dietary items believed by patients to help acne, *n* (% n/N).
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Vitamin A	20 (40.8)
Antioxidants	16 (32.7)
Fish or Omega-3's	14 (28.6)
Zinc	13 (26.5)
N/A - diet Ø help acne	13 (26.5)
Dietary fiber	10 (20.4)
Other	3 (6.1)

TABLE IIIC. Reported acne improvement with dietary change, *n* (% n/N).
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Less fried or greasy foods	10 (20.4)
Less dairy products	7 (14.3)
Less refined carbohydrates	7 (14.3)
Less sugar	6 (12.2)
More water	4 (8.2)
Less soda drinks	3 (6.1)
Less caffeine	2 (4.1)
Less chocolate	2 (4.1)
Less spicy foods	2 (4.1)
Less red meats	1 (2.0)
More basil	1 (2.0)
More fruits or vegetables	1 (2.0)

improvement with less dairy products and 14% reporting improvement with less refined carbohydrates (Table IIIC).

The most widely utilized source of information was a Google search (49%), followed by dermatologist (43%) and then family members and TV (tied at 41%). Medical websites,

TABLE IVA. Sources of information on diet and acne used by patients, *n* (% n/N). [Copyright: ©2016 Nguyen et al.]

Google search	24 (49.0)
Dermatologist	21 (42.9)
Family members	20 (40.8)
TV	20 (40.8)
Friends	17 (34.7)
Medical websites	15 (30.6)
Magazines	13 (26.5)
PCP	9 (18.4)
Other	6 (12.2)
Social media sites	4 (8.2)
Newspaper	2 (4.1)
Significant other	1 (2.0)

TABLE IVB. Satisfied with information from sources, *N* (%).
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Yes	24 (49.0)
No	25 (51.0)

TABLE IVC. Satisfied with diet and acne information provided from sources, *n* (% n/N).
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Google search	11 (45.8)	13 (52.0)
Dermatologist	18 (75.0)	3 (12.0)
Family members	7 (29.2)	13 (52.0)
TV	9 (37.5)	11 (44.0)
Friends	8 (33.3)	9 (36.0)
Medical websites	10 (41.7)	5 (20.0)
Magazines	3 (12.5)	10 (40.0)
PCP	6 (25.0)	3 (12.0)
Other	3 (12.5)	3 (12.0)
Social media sites	2 (8.3)	2 (8.0)
Newspaper	1 (4.2)	1 (4.0)
Significant other	1 (4.2)	0 (0)
	Yes	No

specifically sites such as WebMD or that of the American Academy of Dermatology, were used by 31%, while primary care physician (PCP) was used by 18% (Table IVa).

Respondents were split evenly between those satisfied with the information provided on their sources (49%) and those not satisfied (51%) (Table IVb). This trend was found in almost all categories of sources listed except for: dermatologist, family members, medical websites, and PCP.

Of the 24 out of 49 satisfied respondents, 18 (75%) marked dermatologist as one of their sources of diet and acne information. This is in contrast to the unsatisfied respondents. Of the 25 respondents not satisfied with their information, only 3 (12%) had marked dermatologist as a source of information. Similarly, 10 of 24 satisfied respondents (42%) marked medical websites as one of their sources, whereas 5 of 25 unsatisfied respondents (20%) reported the use of medical websites. These findings reverse when looking at family members as a source of information. Among unsatisfied respondents, 52% had marked family members as a source of diet and acne education, as compared to 29% of satisfied respondents (Table IVc).

Discussion

These beliefs are translating to behavior change

Respondents overwhelmingly believed that diet could affect acne. In fact, only 5% of female patients and only 9% of male patients believed that diet had no effect on acne. These are strongly held beliefs, in that they are translating to behavior change. A majority of respondents, 71%, had changed their diet in order to help their acne.

The majority of patients believed that certain foods may worsen acne

Respondents overwhelmingly believed that foods could aggravate acne. Of the foods listed, the highest percentage of respondents (71%) chose a category that patients have historically described as an acne trigger food: that of fried/greasy foods. This is a popular, long-held belief, as anecdotally, patients sometimes make the connection between greasy foods and increased oil production on the face.

The strongest research evidence, however, supports a link between a high glycemic index (GI) diet and acne [14]. While fried or greasy foods may contribute to a high GI diet, so would sugar, soda drinks, and refined carbohydrates. These categories, however, were listed by much lower percentages of respondents (16%, 35%, and 27%, respectively).

This is an important point to emphasize to our patients. While fried, greasy foods are a concern, so are a number of other foods. As dermatologists, we should be emphasizing that even innocuous foods, such as white bread, pasta, and other refined carbohydrates, when part of an overall high GI diet, may worsen acne.

Chocolate was also noted by a majority of respondents (53%). Chocolate as a dietary factor triggering acne is also a long-held belief, and studies evaluating its role in acne were performed in the 1960s [15]. At this time, though, there is no evidence that a factor specific to chocolate can trigger acne. Rather, research points to its sugar content and contribution to a high GI diet as a possible trigger. Ideally, then, chocolate,

sugar, and refined carbohydrates would have similar ratings by patients, as they may all contribute to a high GI index diet. Our findings indicate that this is not the case. In fact, while 53% reported chocolate as a possible trigger food, only 16% reported sugar as a potential trigger. This is another area in which dermatologists must counsel patients. While chocolate bars may serve as an acne trigger, sugar and other sugary foods are just as concerning.

Of note, although some studies have shown a link to dairy [14], less than half (47%) of our respondents believed that dairy products could aggravate acne.

Patients also believe that certain foods may help acne

An interesting finding is that a significant proportion of respondents believed that certain foods or supplements could help acne. Vitamin A was reported by the highest proportion (41%). This may be due to reports of high-dose vitamin A therapy used in the past as acne therapy, and the fact that acne medications such as tretinoin and isotretinoin are related to vitamin A. Our survey did not distinguish between standard vitamin A supplements and high-dose supplementation, and therefore it is not known whether a belief in vitamin A therapy extends to standard supplement dosing.

When vitamin A is removed from the analysis, the highest category becomes antioxidants (33%), followed by fish or omega-3s (29%), zinc (27%), and dietary fiber (20%). For each of these nutrients, while some promising results in the treatment of acne have been noted from in vitro or animal studies, studies in humans are limited. At this point, these cannot be recommended routinely, but their use by patients cannot be dismissed entirely either.

In conclusion, while there is limited research performed in the area of foods or supplements that may help in the treatment of acne, many of our respondents believe they may help. In an era of rapid dissemination of information, patients are sometimes made aware of promising findings from small studies. This highlights the need for dermatologists to stay abreast of the latest dietary findings, and in particular not to dismiss these out of hand. In addition, dermatologists must be cognizant of the fact that a significant proportion of patients may believe that certain foods or supplements have the ability to combat acne, and therefore must be able to provide information on the limited evidence that exists to support their use.

Information sources

In order to disseminate accurate, evidence-based information, we must understand what sources patients utilize for medical information. In our survey study, less than half (43%) relied on dermatologists for information. The remaining respondents turned to a variety of sources, including the Internet (Google search and medical websites), mass media (maga-

zines, television, and newspaper), and personal relationships (mainly family members and friends).

The sources of information utilized by patients have changed markedly. In a survey study from 1999, general information on acne was obtained most frequently from family physicians (71%) [16]. In our survey, only 18% utilized their primary care physician as a source of information.

The mass media continues to play a role in providing health information. In the 1999 survey study, magazines and television were utilized by 44% each [16]. In our survey study, magazines were utilized by 27%, and television was utilized by 41% of respondents.

The most notable change has been the rise of the Internet as a tool for health information. Our respondents utilized Google most frequently (49%) as a source of information, with medical websites utilized by 31%. In the 1999 study [16], the Internet was not listed as a source of information.

It is clear that the Internet has had a significant impact on health information-seeking behavior. What is less clear is how physicians should respond to this change when educating our patients. In this study, more patients obtained information from the Internet than from their primary care physician or their dermatologist. However, a significant number of those satisfied with their diet and acne education had marked PCP (25%) or dermatologist (75%) as one of their sources of information. Conversely, the majority of respondents not satisfied with their information source did not mark dermatologist or PCP as a source of information (86%).

Thus, with so many acne patients making dietary changes, and many of them turning to the Internet for information to guide them, it becomes even more imperative that physicians be educated on the topic of acne and diet and be able to serve as an authoritative source. For those patients who seek further information, we also need to be able to refer patients to credible sources of online health information, with specific recommendations for high-quality, up-to-date health information websites. Our study suggests that education from physicians and medical websites is correlated with higher satisfaction in patients.

Physicians must also counsel patients on the drawbacks of utilizing search engines for health information, as opposed to utilizing well-regarded medical websites. If relying on a Google search, patients may be directed to commercial sites or sites containing inaccurate information. Patients must be made aware of this notable risk when using a Google search.

Finally, we need to ensure, as a profession, that health education materials are easily available on the Internet and that such information is accurate, evidence-based, free from commercial bias, and reflective of the most current research findings.

Study weaknesses

Due to the design of this exploratory survey study, patients were recruited from the population of patients seeking treatment for acne at a single academic institution. This resulted in a skewed patient population. Most, 45 of 49, were college educated (92%). Most, 38 of 49, were female (78%). Most, 31 of 49, were of normal weight (63%), with only 15 of 49 (31%) categorized as overweight or obese. This is in contrast to the U.S. population, in which 69% are overweight or obese; 29% are college educated; and 51% are female [17,18,19].

Another weakness of the study may be the lack of a quantitative definition of acne severity. In the past, multiple quantitative classification systems have been proposed, though these methods have been inconsistently accurate in the clinical setting [20]. Given the variable expressions of acne, as well as its psychosocial factors difficult to quantitate, a more important assessment of severity may be the patient's perception of its impact [20], which we elicited in the study.

Conclusion

This survey study was designed to explore patient beliefs regarding the link between diet and acne. In this small sample, the overwhelming majority of respondents believed that diet could affect acne. This belief impacted behavior, as the majority had changed their diets in order to improve their acne.

Due to the study design, the results from this patient sample cannot be applied to the general population. However, even in this highly educated patient population, there was a persistence of long-held beliefs that certain foods may serve as acne triggers (i.e., fried or greasy foods and chocolate) and less recognition of the foods that research has identified as potential triggers (i.e., sugars, refined carbohydrates, and dairy). Many respondents also reported a belief that certain foods or supplements could help acne, an area with some promising preliminary results but one that requires further investigation before any conclusions may be drawn.

Especially given the multiplicity of information sources utilized by patients, as well as the ongoing research in this area and subsequent evolving recommendations, dermatologists must serve as an authoritative information source. Dermatologists must be able to provide a balanced overview of this topic to their patients and be able to direct patients to credible, balanced sources for additional dietary change recommendations.

These findings indicate a need for further study on the best practices in providing health information, especially as medical recommendations are evolving. Our population was highly educated, and the majority was of normal weight. Further research in this area must target a more diverse population. Even within this skewed population, however, we noted

widely conflicting beliefs among acne patients. There is a clear need for easily available, evidence-based, and up-to-date information on the link between diet and acne.

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